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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,057	10/28/2003	Qing Deng	15436.170.1	5980

22913 7590 04/11/2006

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EXAMINER	
VAN ROY, TOD THOMAS	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 04/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary	Application No.	Applicant(s)
	10/695,057	DENG ET AL.
	Examiner	Art Unit
	Tod T. Van Roy	2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 27 January 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-26 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-26 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

The objection to the disclosure is withdrawn.

Response to Amendment

The examiner acknowledges the amending of claims 1-3, 5-19, 22-23, cancellation of claim 4, and the addition of claims 24-26.

Response to Arguments

Applicant's arguments filed 01/27/2006 have been fully considered but they are not persuasive.

The applicant contests that the "Peltier" device noted in the previous rejection as being a heating source is in actuality a cooling device.

The examiner does not agree that a Peltier element is not used for heating. A Peltier device operates via a current applied to two different metals, or a semiconductor p-n junction. The direction of the applied current determines whether the element is then acting as a cooler or a heater. The examiner notes the website cited in pg.2 para.2 of the applicant's remarks, and directs the applicant to the same website wherein is taught:

Peltier devices, also known as thermoelectric (TE) modules, are small solid-state devices that function as heat pumps. A "typical" unit is a few millimeters thick by a few millimeters to a few centimeters square. It is a sandwich formed by two ceramic plates with an array of small Bismuth Telluride cubes ("couples") in between. When a DC current is applied heat is moved from one side of the device to the other - where it must be removed with a heatsink. The "cold" side is commonly used to cool an electronic

device such as a microprocessor or a photodetector. ***If the current is reversed the device makes an excellent heater.***

noting the bold highlight. This forward/reverse current Peltier arrangement is quite common in the art in order to reduce number of necessary components and allow for wide temperature ranges from a single operating stage. In addition, Young teaches the use of a "Peltier-cooled" stage (pg.6 col.1-2 para.1) wherein it is taught that the temperature operation is from 15 to 95C, indicating the ability of the Peltier device to act as both a heater and a cooler.

In addition, the applicant's assertion that Young describes heating of the junction as a limiting factor in the devices is true, for both broad and small diameter devices, which is why one of the methods to overcome the limitation is to adjust the peak operating conditions of the laser devices to be at higher temperatures. Young then states that this method works best for small diameter devices, while broad diameter devices seem to function better being cooled, rather than via adjusting the operating temperature (pg.8 col.2, conclusion, lines 5-22). This is not indicative of teaching away, but simply stating which methods work best for which device types.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 26 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one

skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 26 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 26 describes an ability of the control module to operate in whichever operational mode requires the least amount of energy relative to the other, while this option is not disclosed in the specification, and is believed to constitute new matter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-3, and 5-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. ("Enhanced Performance of Offset-Gain High-Barrier Vertical-cavity Surface-Emitting Lasers", dated June 1993, IEEE Journal of Quantum Electronics Volume 29, Number 6, pages 2013-2022, by D.B. Young J.W. Scott F.H. Peters, M.G. Peters, M.L. Majewski B.J. Thibeault, Scott W. Corzine, and Larry A. Coldren) in view of Kasper et al. (US 5740191).

With respect to claims 1, and 6, Young teaches a vertical cavity surface emitting laser module, the module comprising: a vertical cavity surface emitting laser (fig.16 VCSEL) that has a predetermined (abs., pg.2 col.1 para.1) operating temperature that corresponds with desired operational characteristics of the VCSEL, wherein the vertical cavity surface emitting laser is tuned such that the predetermined operating temperature is higher than a room temperature (pg.8 col.2 para.2, 40-45C), a temperature sensor (fig.16, thermistor); and a heating element (fig.16 Peltier). Young does not teach the heating element to be configured to transfer heat to the VCSEL when the temperature sensor senses a temperature measurement that is below an activation value, wherein the predetermined value is determined in relation to the predetermined operating temperature of the vertical cavity surface-emitting laser. Kasper teaches a laser package including a heated laser diode (abs.) configured to turn on when the temperature sensor senses a temperature measurement that is below a predetermined value, wherein the predetermined value is determined in relation to an optimal operating temperature of the semiconductor laser (abs.). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module of Young

with the temperature control of Kasper in order to avoid deleterious low temperature effects (Kasper, col.1 lines 42-46) and maintain the higher optimal operating temperature of the laser device regardless of the room temperature.

With respect to claim 2, Young and Kasper teach the laser module outlined in the rejection to claim 1, Young further teaches that heating of the junction due to series resistance affects the predetermined operating range (pg.7 col.1 para.3), but does not teach the optimal operating temperature is a function of a thickness of an active layer included in the VCSEL. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Young's teaching of the junction heating due to series resistance affecting the optimal operating range with the ability to adjust the optimal operating temperature via active region thickness as this thickness is directly related to a series resistance of the device (i.e., one way to change the series resistance would be to change the active layer material thickness).

With respect to claim 3, Young and Kasper teach the laser module outlined in the rejection to claim 1, and Young further teaches configuring the predetermined operating temperature by adjusting a composition of an active layer included in the VCSEL (pg.2 col.1 para.1).

With respect to claim 5, Young and Kasper teach the laser module outlined in the rejection to claim 1, and Young further teaches that at the predetermined operating temperature a cavity resonance point of the VCSEL is substantially aligned with a gain peak bandwidth (pg.2 col.2 para.2, fig.3 (b)) of the VCSEL.

With respect to claim 7, Young and Kasper teach the laser module outlined in the rejection to claim 1, and Young further teaches the use of a Peltier device as the heating element. Young does not teach the use of a resistive heating element. Kasper teaches a laser package including a heated laser diode (abs.) that is heated using a resistive heating element (col.2 lines 14-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the Peltier device of Young with the resistive heating element of Kasper as the use of resistive heating elements is widely recognized in the art, and are simple and economical to utilize.

With respect to claims 8 and 9, Young teaches a vertical cavity surface emitting laser module, the module comprising: a vertical cavity surface emitting laser (VCSEL) having an active region (fig.2), wherein a thickness and a composition of the VCSEL are configured such that a predetermined operating temperature (abs., pg.2 col.1 para.1) of the VCSEL is higher than about room temperature (pg.7 col.1 para.3-see claim2, pg.2 col.1 para.1-see claim 3), a temperature sensor that senses an operating temperature of the VCSEL (fig.16 thermistor); and a control module (fig.16 temp feedback control). Young does not teach the control to prevent the operating temperature of the VCSEL from falling below an activation temperature using a heater to raise the operating temperature to the predetermined operating temperature. Kasper teaches a laser package including a heated laser diode (abs.) configured to turn on when the temperature sensor senses a temperature measurement that is below a predetermined value, wherein the predetermined value is determined in relation to an optimal operating temperature of the semiconductor laser (abs.). It would have been obvious to one of

ordinary skill in the art at the time of the invention to combine the laser module of Young with the temperature control of Kasper in order to avoid deleterious low temperature effects (Kasper, col.1 lines 42-46) and maintain the higher optimal operating temperature of the laser device regardless of the room temperature.

With respect to claim 10, Young and Kasper teach the laser module outlined in the rejection to claim 8, and Young further teaches that at the predetermined operating temperature a cavity resonance point of the VCSEL is substantially aligned with a gain peak bandwidth (pg.2 col.2 para.2, fig.3 (b)) of the VCSEL.

With respect to claim 11, Young and Kasper teach the laser module outlined in the rejection to claim 8, and Young further teaches a vertical cavity surface emitting laser (fig.16 VCSEL) that has a predetermined operating temperature, wherein the vertical cavity surface emitting laser is tuned such the optimal operating temperature is higher than a room temperature (pg.8 col.2 para.2, 40-45C).

With respect to claims 12 and 13, Young and Kasper teach the laser module outlined in the rejection to claim 8, including the device having been optimized to between 40-45C and operable to up to 145C (pg.8 col.2 para.2). Young and Kasper do not teach the predetermined operating temperature to be greater than 50C or 70C. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the optimal operating temperature to any desirable level using the techniques of Young in order to suit the environmental conditions the given device was to be operated at (the optimal range of Young was chosen as an example, not as an exclusive range, as noted by the teaching of the device being operable to about 145C, therefor it would

be within the general skill of a worker in the art to chose the most suitable range for the application).

With respect to claims 14 and 15, Young and Kasper teach the laser module outlined in the rejection to claim 8, and Young further teaches the activation temperature to be determined in relation to the predetermined operating temperature (pg.2 col.2 para.2, fig.3b, threshold vs. temp behavior changing with regards to shifting of the cavity mode and gain spectrum), and room temperature (pg.2 col.2 para.2, cavity mode not aligned at room temp).

With respect to claim 16, Young and Kasper teach the laser module outlined in the rejection to claim 8, and Kasper further teaches turning the temperature off when the chosen the predetermined operating temperature is exceeded (col.2 lines 23-26, col.4-5 lines 67-2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module with the function of turning the heating element off when the optimal temperature is exceeded to maintain the temperature range which would lead to the best output power and device efficiency.

With respect to claims 17 and 23, Young teaches a vertical cavity surface emitting laser module, the module comprising: a vertical cavity surface emitting laser (VCSEL) having an active region (fig.2) with a thickness and a composition such that (pg.7 col.1 para.3-see claim2, pg.2 col.1 para.1-see claim 3) a corresponding cavity resonance substantially aligns with a gain bandwidth peak (pg.2 col.2 para.2, fig.3 (b)) of the VCSEL at a predetermined operating temperature (abs., pg.2 col.1 para.1) that is higher than 30 degrees Celsius (pg.8 col.2 para.2, 40-45C), a temperature sensor that

senses an operating temperature of the VCSEL (fig.16 thermistor); a heating element (fig.16 Peltier), and a control module (fig.16 temp feedback control). Young does not teach switching the heating element on and off based on a value of the operating temperature received from the temperature sensor, wherein the control module turns the heating element on when the operating temperate reaches a threshold temperature that is below the optimal operating temperature and wherein the control module turns the heating element off when the operating temperature is within a predetermined range (could be zero degrees) or exceeds the optimal operating temperature. Kasper teaches a laser package including a heated laser diode (abs.) configured to turn on when the temperature sensor senses a temperature measurement that is below a predetermined value, wherein the predetermined value is determined in relation to an optimal operating temperature of the semiconductor laser (abs.), and Kasper further teaches turning the temperature off when the chosen optimal operating temperature is exceeded (col.2 lines 23-26, col.4-5 lines 67-2). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module of Young with the temperature control of Kasper in order to avoid deleterious low temperature effects (Kasper, col.1 lines 42-46) and maintain the higher optimal operating temperature of the laser device regardless of the room temperature (heating to the chosen range) as well as to maintain the temperature range which would lead to the best output power and device efficiency (i.e., once the range has been exceeded discontinue the heating).

With respect to claims 18 and 19, Young and Kasper teach the laser module outlined in the rejection to claim 17, including the device having been optimized to

between 40-45C and operable to up to 145C (pg.8 col.2 para.2). Young and Kasper do not teach the predetermined operating temperature to be greater about 70C but less than 90C. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the optimal operating temperature to any desirable level using the techniques of Young in order to suit the environmental conditions the given device was to be operated at (the optimal range of Young was chosen as an example, not as an exclusive range, as noted by the teaching of the device being operable to about 145C, therefor it would be within the general skill of a worker in the art to chose the most suitable range for the application).

With respect to claim 20, Young and Kasper teach the laser module outlined in the rejection to claim 17, and Young further teaches the heating element to be in contact with a portion of the VCSEL (fig.16, conductive heat block (brass submount) shown to be in direct contact with the VCSEL).

With respect to claim 21, Young and Kasper teach the laser module outlined in the rejection to claim 17, and Kasper further teaches the heating element to be within an enclosed area with the VCSEL (heating element #20 located inside cylindrically packaged laser module #8). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module with the enclosed VCSEL and heating element to protect both pieces from any damage during operation, and further thermally isolate them from the potentially uncontrolled room temperature conditions.

With respect to claim 22, Young and Kasper teach the laser module outlined in the rejection to claim 17, and Young further teaches the use of a Peltier device as the

heating element. Young does not teach the use of a resistive heating element. Kasper teaches a laser package including a heated laser diode (abs.) that is heated using a resistive heating element (col.2 lines 14-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the Peltier device of Young with the resistive heating element of Kasper as the use of resistive heating elements is widely recognized in the art, and are simple and economical to utilize.

With respect to claims 24-25, Young teaches a vertical cavity surface emitting laser module, the module comprising: a vertical cavity surface emitting laser (VCSEL) (fig.2), a temperature sensor that senses an operating temperature of the VCSEL (fig.16 thermistor); a heating element in thermal communication with the VCSEL (fig.16 Peltier) and a control module (fig.16 temp feedback control). Young does not teach the control to operate in either a first temperature change = drive current change, or a second, temperature change = thermal output change, mode. Kasper teaches a laser package including a heated laser diode (abs.) configured to turn on when the temperature sensor senses a temperature measurement that is below a predetermined value, and a drive current mode that controls the drive current based on the temperature change (col.3 lines 35-40). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module of Young with the temperature control of Kasper in order to avoid deleterious low temperature effects (Kasper, col.1 lines 42-46) and maintain the higher optimal operating temperature of the laser device regardless of the room temperature.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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PRIMARY EXAMINER